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| 09/729,939 | 12/05/2000 | Rajashri Joshi | N0080 US | 1111 |

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| EXAMINER |
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CHOJNACKI, MELLISSA M

| ART UNIT | PAPER NUMBER |
|----------|--------------|
| 2175 | |

DATE MAILED: 03/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/729,939

Applicant(s)

JOSHI ET AL.

Examiner

Mellissa M Chojnacki

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-35 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

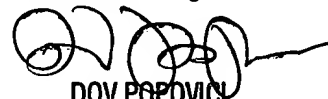
Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.



DOV POPOVICI
SUPERVISORY PATENT EXAMINER
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Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2-3.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

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DETAILED ACTION

Specification

1. The abstract contains more than 150 words. The abstract should contain 150 words or less. Appropriate corrections are required according to the guidelines provided below:

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-3, 8-14, 16-27 and 29-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meek et al. (U.S. Patent No. 6,029,173) in view of Krishnamurthy (U.S. Patent No. 6,256,038).

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As to claim 1, Meek et al. teaches a method for representing geographic features in a computer-based system (See abstract), comprising:

providing a first computer-usable database storing a plurality of data points specifying coordinates of locations along at least one geographic feature (See column 3, lines 42-50);

storing the control points in a second computer-usable database (See abstract, column 4, lines 65-67), the control points being usable for representing the geometry of the at least one geographic feature in the computer-based system (See column 4, lines 65-67; column 5, lines 6-11).

Meek et al. does not teach fitting a polynomial spline to the at least one geographic feature by applying a least squares approximation to the data points to generate a plurality of control points for the polynomial spline.

Krishnamurthy teaches parameterized surface fitting technique having independent control of fitting and parameterization (See abstract) in which he teaches fitting a polynomial spline to the at least one geographic feature by applying a least squares approximation to the data points to generate a plurality of control points for the polynomial spline (See column 6, lines 60-67).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Meek et al., to include fitting a polynomial spline to the at least one geographic feature by applying a least squares approximation to the data points to generate a plurality of control points for the polynomial spline.

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It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Meek et al., by the teachings of Krishnamurthy because fitting a polynomial spline to the at least one geographic feature by applying a least squares approximation to the data points to generate a plurality of control points for the polynomial spline would create an improved and more flexible techniques for fitting smooth surfaces to polygon meshes, since having flexibility and control over surface parameterization and fit is crucial for most applications (See Krishnamurthy, column 2, lines 15-18).

As to claim 2, Meek et al. as modified, teaches wherein the data points are selected from the group consisting of coordinate pairs and coordinate triples (See Meek et al., column 6, lines 31-38, lines 42-48).

As to claim 3, Meek et al. as modified, teaches configuring the number of control points (See Meek et al., See column 7, lines 38-43; column 8, lines 29-38).

As to claims 8, 20, 24 and 30 Meek et al. as modified, teaches incorporating in the least squares approximation a bearing value associated with a node included in the plurality of data points (See Meek et al., column 1, lines 9-16; column 5, lines 51-60; Krishnamurthy, column 6, lines 60-67); incorporating in the least squares approximation a bearing value associated with a node included in the plurality of data points (See Meek et al., column 1, lines 9-16; column 5, lines 51-60; Krishnamurthy, column 6, lines

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60-67); wherein the spline control points are derived by incorporating in the least squares approximation a bearing value associated with a node included in the plurality of data points (See Meek et al., column 1, lines 9-16; column 5, lines 51-60; Krishnamurthy, column 6, lines 60-67); wherein the processor is configured to incorporate in the least squares approximation a bearing value associated with a node included in the plurality of data points (See Meek et al., column 1, lines 9-16; column 5, lines 51-60; Krishnamurthy, column 6, lines 60-67).

As to claims 9, 21, 25 and 31, Meek et al. as modified, teaches weighting a node included in the plurality of data points in the least squares approximation (See Meek et al., column 1, lines 9-16; column 5, lines 51-60; Krishnamurthy, column 13, lines 34-36); weighting a node included in the plurality of data points (See Meek et al., column 1, lines 9-16; column 5, lines 51-60; Krishnamurthy, column 13, lines 34-36); wherein the spline controls points are derived using the least squares approximation by weighting a node included, in the plurality of data points (See Meek et al., column 1, lines 9-16; column 5, lines 51-60; Krishnamurthy, column 13, lines 34-36); wherein the processor is configured to weight a node included in the plurality of data points in the least squares approximation (See Meek et al., column 1, lines 9-16; column 5, lines 51-60; Krishnamurthy, column 13, lines 34-36).

As to claims 10, 22, 26 and 32, Meek et al. as modified, teaches employing regularization in computing the least squares approximation (See Krishnamurthy,

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column 10, lines 55-58; column 31, lines 22-26); employing regularization in the least squares approximation (See Krishnamurthy, column 10, lines 55-58; column 31, lines 22-26); wherein the spline control points are derived by employing regularization in the least squares approximation (See Krishnamurthy, column 10, lines 55-58; column 31, lines 22-26); wherein the processor is configured to employ regularization in computing the least squares approximation (See Krishnamurthy, column 10, lines 55-58; column 31, lines 22-26).

As to claims 11, 17, 27 and 33 Meek et al. as modified, teaches identifying a straight section of the at least one geographic feature (See Meek et al., column 3, lines 13-17, lines 29-33); and storing in the second computer-usable database the data points corresponding to the straight section (See Meek et al., column 3, lines 62-67; column 4, lines 1-6; column 5, lines 51-60); identifying a straight section of a geographic feature based on the data points (See Meek et al., column 3, lines 13-17, lines 29-33); and storing in the computer-usable database the data points corresponding to the straight section of the geographic feature (See Meek et al., column 3, lines 62-67; column 4, lines 1-6); wherein the processor is configured to determine whether the geographic feature includes a straight section, and if so, linearly interpolate the data points representing the straight section (See Meek et al., column 3, lines 62-67; column 4, lines 1-6); wherein the processor is configured to determine whether the at least one geographic feature has a substantially straight section, and if so, to store in the second

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computer-usable database the data points corresponding to the straight section (See Meek et al., column 3, lines 62-67; column 4, lines 1-6).

As to claims 12, 18 and 34 Meek et al. as modified, teaches computing the control points only for one or more curved sections of the at least one geographic feature (See Meek et al., abstract; column 4, lines 58-65; column 6, lines 3-3-9); computing the control points only for one or more curved sections of the geographic feature (See Meek et al., abstract; column 4, lines 58-65; column 6, lines 3-3-9); wherein the processor computes the control points only for one or more curved sections of the at least one geographic feature (See Meek et al., abstract; column 4, lines 58-65; column 6, lines 3-3-9).

As to claim 13, Meek et al. as modified, teaches computing the control points such that the tangent to the spline approximation of a curved section of the at least one geographic feature and the tangent to the straight section are equal at the point at which the curved and straight section meet (See Meek et al., column 6, lines 20-30; Krishnamurthy column 35, lines 34-42).

As to claim 14, Meek et al. teaches a method of displaying on a computer output device a function representing a geographic feature (See abstract), comprising:

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retrieving from a computer-usable database a plurality of spline control points associated with the geographic feature (See column 4, lines 65-67; column 5, lines 6-11);

calculating a polynomial spline using the spline control points to generate the function representing the geometry of the geographic feature (See column 4, lines 65-67; column 5, lines 6-11); and displaying the function on the computer output device (See column 3, lines 42-50).

Meek et al. does not teach the spline control points being derived, using a least squares approximation, from a plurality of data points specifying coordinates of locations along the geographic feature.

Krishnamurthy teaches parameterized surface fitting technique having independent control of fitting and parameterization (See abstract) in which he teaches the spline control points being derived, using a least squares approximation, from a plurality of data points specifying coordinates of locations along the geographic feature (See column 6, lines 60-67; column 11, lines 46-52).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Meek et al., to include the spline control points being derived, using a least squares approximation, from a plurality of data points specifying coordinates of locations along the geographic feature.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Meek et al., by the teachings of Krishnamurthy because the spline control points being derived, using a least squares approximation,

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from a plurality of data points specifying coordinates of locations along the geographic feature would create an improved and more flexible techniques for fitting smooth surfaces to polygon meshes, since having flexibility and control over surface parameterization and fit is crucial for most applications (See Krishnamurthy, column 2, lines 15-18).

As to claim 16, Meek et al. teaches a method of generating a computer-usable database that represents feature geometry using a plurality of spline control points associated with a plurality of geographic features (See abstract), comprising:

providing a predetermined database that represents feature geometry using a plurality of data points specifying coordinates of locations along the geographic features (See column 4, lines 65-67; column 5, lines 6-11; column 6, lines 31-38, lines 42-48);

for each of the geographic features, retrieving a corresponding set of data points from the predetermined database (See column 4, lines 65-67; column 5, lines 6-11); and

storing the plurality of spline control points in the computer-usable database (See column 4, lines 65-67; column 5, lines 6-11).

Meek et al. does not teach fitting a polynomial spline to each of the geographic features by computing a plurality of control points yielding the least squares approximation to the corresponding set of data points.

Krishnamurthy teaches parameterized surface fitting technique having independent control of fitting and parameterization (See abstract) in which he teaches

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fitting a polynomial spline to each of the geographic features by computing a plurality of control points yielding the least squares approximation to the corresponding set of data points (See column 6, lines 60-67; column 11, lines 46-52).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Meek et al., to include fitting a polynomial spline to each of the geographic features by computing a plurality of control points yielding the least squares approximation to the corresponding set of data points.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Meek et al., by the teachings of Krishnamurthy because fitting a polynomial spline to each of the geographic features by computing a plurality of control points yielding the least squares approximation to the corresponding set of data points would create an improved and more flexible techniques for fitting smooth surfaces to polygon meshes, since having flexibility and control over surface parameterization and fit is crucial for most applications (See Krishnamurthy, column 2, lines 15-18).

As to claim 19 Meek et al. as modified, teaches computing the control points for a geographic feature that has a curved section and an adjoining straight section such that a bearing value at an endpoint of the curved section equals a corresponding bearing value at an endpoint of the straight section that meets the curved section (See Meek et al., column 3, lines 13-25, lines 29-36; Krishnamurthy, column 28, lines 16-30).

As to claim 23, Meek et al. teaches a system for displaying a function representing the geometry of a geographic feature (See abstract; column 1, lines 10-16), comprising:

a database storing one or more spline control points associated with the geographic feature (See abstract; column 1, lines 10-16; column 2, lines 1-5);

a processor configured to compute a polynomial spline using the spline control points to generate the function representing the geometry of the geographic feature (See abstract; column 1, lines 10-16; column 2, lines 1-5; column 4, lines 58-60);

and a display device for displaying the polyline (See abstract; column 1, lines 47-56).

Meek et al. does not teach the spline control points being derived, using a least squares approximation, from a plurality of data points specifying coordinates of locations along the geographic feature.

Krishnamurthy teaches parameterized surface fitting technique having independent control of fitting and parameterization (See abstract) in which he teaches the spline control points being derived, using a least squares approximation, from a plurality of data points specifying coordinates of locations along the geographic feature (See column 6, lines 60-67; column 11, lines 46-52).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Meek et al., to the spline control points being derived, using a least squares approximation, from a plurality of data points specifying coordinates of locations along the geographic feature.

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It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Meek et al., by the teachings of Krishnamurthy because the spline control points being derived, using a least squares approximation, from a plurality of data points specifying coordinates of locations along the geographic feature would create an improved and more flexible techniques for fitting smooth surfaces to polygon meshes, since having flexibility and control over surface parameterization and fit is crucial for most applications (See Krishnamurthy, column 2, lines 15-18).

As to claim 29, Meek et al. teaches a system for generating a plurality of spline control points that represent feature geometry (See abstract; column 1, lines 10-16), comprising:

a first computer-usable database for storing a plurality of data points specifying coordinates of locations along at least one geographic feature (See column 4, lines 65-67; column 5, lines 6-11); and

a second computer-usable database for storing the control points (See abstract, column 4, lines 65-67).

Meek et al. does not teach a processor configured to apply a least squares approximation to the data points to generate the plurality of control points for a polynomial spline.

Krishnamurthy teaches parameterized surface fitting technique having independent control of fitting and parameterization (See abstract) in which he teaches a

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processor configured to apply a least squares approximation to the data points to generate the plurality of control points for a polynomial spline (See column 6, lines 60-67; column 11, lines 46-52).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Meek et al., to include a processor configured to apply a least squares approximation to the data points to generate the plurality of control points for a polynomial spline.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Meek et al., by the teachings of Krishnamurthy because a processor configured to apply a least squares approximation to the data points to generate the plurality of control points for a polynomial spline would create an improved and more flexible techniques for fitting smooth surfaces to polygon meshes, since having flexibility and control over surface parameterization and fit is crucial for most applications (See Krishnamurthy, column 2, lines 15-18).

5. Claims 4, 15, 28 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meek et al. (U.S. Patent No. 6,029,173) in view of Krishnamurthy (U.S. Patent No. 6,256,038) as applied to claims 1-3, 8-14, 16-27 and 29-34 above, and further in view of Dayanand et al. (U.S. Patent No. 6,639,592).

As to claim 4, Meek et al. as modified, does not teach wherein the polynomial spline is selected from the group consisting of uniform non-rational B-spline,

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non-uniform non-rational B-spline, uniform Catmull-Rom spline, non-uniform Catmull-Rom spline, and NURBS.

Dayanand et al. teaches curve network modeling (See abstract), in which he teaches wherein the polynomial spline is selected from the group consisting of uniform non-rational B-spline, non-uniform non-rational B-spline, uniform Catmull-Rom spline, non-uniform Catmull-Rom spline, and NURBS (See abstract; column 2, lines 27-29; column 4, lines 20-29).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Meek et al. as modified, to include wherein the polynomial spline is selected from the group consisting of uniform non-rational B-spline, non-uniform non-rational B-spline, uniform Catmull-Rom spline, non-uniform Catmull-Rom spline, and NURBS.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Meek et al. as modified, by the teachings of Dayanand et al. because wherein the polynomial spline is selected from the group consisting of uniform non-rational B-spline, non-uniform non-rational B-spline, uniform Catmull-Rom spline, non-uniform Catmull-Rom spline, and NURBS would enable a computer modeler to represent arbitrary curved surfaces very accurately (See Dayanand et al., column 1, lines 44-52).

As to claims 15, 28 and 35 Meek et al. as modified, teaches wherein the polynomial spline is selected from the group consisting of uniform nonrational B-spline,

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non-uniform nonrational B-spline, uniform Catmull-Rom spline, nonuniform Catmull-Rom spline, and NURBS (See Dayanand et al., abstract; column 2, lines 27-29; column 4, lines 20-29); wherein the polynomial spline is selected from the group consisting of uniform nonrational B-spline, non-uniform nonrational B-spline, uniform Catmull-Rom spline, nonuniform Catmull-Rom spline, and NURBS (See Dayanand et al., abstract; column 2, lines 27-29; column 4, lines 20-29); wherein the polynomial spline is selected from the group consisting of a uniform nonrational B-spline, nonuniform nonrational B-spline, uniform Catmull-Rom spline, nonuniform Catmull-Rom spline, and NURBS (See Dayanand et al., abstract; column 2, lines 27-29; column 4, lines 20-29).

6. Claims 5-7 rejected under 35 U.S.C. 103(a) as being unpatentable over Meek et al. (U.S. Patent No. 6,029,173) in view of Krishnamurthy (U.S. Patent No. 6,256,038) as applied to claims 1-3, 8-14, 16-27 and 29-34 above, and further in view of Rohm et al. (U.S. Patent No. 6,253,164)

As to claim 5, Meek et al. as modified, does not teach defining a knot sequence for the polynomial spline.

Rohm et al. teaches curves and surfaces modeling based on a cloud of points (See abstract), in which he teaches defining a knot sequence for the polynomial spline (See column 4, lines 17-21).

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Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Meek et al. as modified, to include defining a knot sequence for the polynomial spline.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Meek et al. as modified, by the teachings of Rohm et al. because defining a knot sequence for the polynomial spline would allow the modeler to only capture spatial information and the system will generate all surfaces automatically (See Rohm et al., column 2, lines 32-34).

As to claim 6, Meek et al. as modified, teaches manually defining the knot sequence (See Rohm et al., column 4, lines 17-33).

As to claim 7, Meek et al. as modified, teaches storing the knot sequence in the second computer-usable database (See Rohm et al., column 4, lines 17-33).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents are cited to further show the state of the art with respect to a method and system for representation of geographical features in a computer-based system in general:

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U.S. Patent No. 6,345,235 to Edgecombe et al., for disclosing method and apparatus for determining multi-dimensional structure.


U.S. Patent No. 5,771,310 to Vannah, for disclosing method and apparatus for recording three-dimensional topographies.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mellissa M. Chojnacki whose telephone number is 730-305-8769. The examiner can normally be reached on 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dov Popovici can be reached on 703-305-3830. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mmc
March 11, 2004


DOV POPOVICI
SUPERVISORY PATENT EXAMINER
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